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CURRENT EDUCATIONAL LITERATURE

The "Compound Dozierende Method" of Teaching of Mathematics, from privately printed pamphlet of GEORGE E. FISHER and I. J. SCHWATT, of the University of Pennsylvania.

The "compound dozierende method" advocates devoting the major part of the hour to the explanation of difficult points in text and problems. This course is of advantage not only to the dull but to the bright, for it broadens the knowledge and conceptions of all. We have found by our experience both as teachers and as pupils of wise and distinguished instructors, that even a bright student, who may perhaps appreciate no difficulty in a particular theorem or problem, can have his knowledge made more sure and of wider application by listening to explanations, questions and answers, perhaps, given or directed by a teacher who "knows more than the text-book" (not necessarily more than its author). Better an excellent teacher with a poor text-book or none at all, than a superior book with an inferior teacher. By this method the student's strength in, and aptitude for, mathematical work, his powers of thinking for himself, are all developed.

We would emphasize the fact that this method is not one of pure lecturing, as in a German university, although much of the hour is occupied by the teacher's explanations. It seeks rather to point out wherein are the difficulties, to lead the students by judicious questions to correct explanations of them. It would analyze a problem or theorem, pointing out and *drawing out from the student*, what are the given data, how they can be used, what wider applications they have, how they bear upon somewhat similar questions, etc. In a word it seeks not merely to assist the student but to teach him to help himself. This method cautions against wrong inferences from, and use of, given data, directs in the right way, and seeks to infuse somewhat of the spirit of the subject, not merely the dry bones of the facts, into the mental life of the students. This essential teaching certainly cannot be given in one hour set aside by the instructor for consultation with his student, as we have heard suggested by advocates of the recitation method.

Evidently this requires active physical as well as mental work on the instructor's part, and that he shall be much of the time at the blackboard. *It is essential that the attention of the entire class be concentrated upon the single piece of work that is being done*, whether by the instructor or a student. We dwell upon this vital point. Even in the part of the hour which is devoted to work by the students, but one shall be at the board at a time, explaining the work assigned to him (while it is progressing, if possible). Each member of the class is expected to follow the work, and promptly to answer any questions relating to it. In this way is secured, as in no other, orderly attention, and more than all else, *each minute of the hour is rendered of maximum benefit to the greatest number*.

It would be far easier for the teacher to assign work to as many men as his

blackboard space would accommodate, and from his chair to keep a record of their performance or non-performance of the exercises set. It is a straining, tiring system to give and direct many explanations, and one which well might not be employed, if bodily and mental ease were considered of first importance. The method of recitations can be made so free from strain for the teacher, that, if he be a fanatic in his principles, he can conduct his "recitation" not only without leaving his seat, but also without uttering a word. We recall, in this connection, the method of the old German professor, who, on entering his room, called a certain number of students to the board by a particular sign, and at the end of the hour by another sign indicated whether the students should go on in advance or repeat the lesson, he, from his easy chair, only marking the failures and successes. Very likely, he, also, had an hour for private consultation with his students, at which time, if not in mathematics, at least in his system of signals, he gave instruction. If it were not for the giving of marks, which requires some slight mental activity, in these days of inventions a clever machine could replace the distinguished professor.

It does not especially benefit a student to re-work at the board a problem which he has already solved at home, or to convince his teacher at the end of the hour that he is insufficiently prepared through a failure to solve his special piece of work. The student does need practice in working for himself, and he often needs instruction while he is at work. We believe, therefore, in giving some part of the hour to individual work by the students, accompanied by the necessary suggestions and directions by the teacher, keeping in mind always the needs of the entire class. We purposely avoid the word "recitation"—parrots recite, not students. Any problem or part of the text that presents no difficulty is passed by (not omitted from the lesson) in preference to those portions involving special difficulties or important principles. Such a method is harder, too, for the students, in some respects, and yet, that the efforts of their instructors are appreciated and approved by them, is shown by a recent occurrence. An instructor having changed from the compound *dozierende* method to that of recitations for some reason the students of one department petitioned their head to request a return to the original method of instruction.

We do not fail to realize that this system must be accompanied by some method of keeping the students from neglecting their work, and of giving credit for progress. He is a very poor teacher who does not quickly learn from the faces before him, and especially from answers to frequent questions, who is and who is not *thinking*, who does and who does not understand. Nevertheless, we supplement the daily work, by written reviews. This gives to the student a fairer chance, since he has an opportunity to work a variety of questions, and it affords the teacher the best means of determining wherein his students are failing. It is emphasized that these reviews are considered in no way different from work at the board and not as an examination. After each review, those points which seem not fully to have been understood, are taken up and explained again.